FCC 96-311

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Rulemaking to Amend Parts 1, 2, 21, and 25 of the Commission's Rules to Redesignate the 27.5-29.5 GHz Frequency Band, to Reallocate the 29.5-30.0 GHz Frequency Band, to Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Services	)	CC Docket No. 92-297

FIRST REPORT AND ORDER

and

FOURTH NOTICE OF PROPOSED RULEMAKING

Adopted: July 17, 1996 Released: July 22, 1996

Comment Date: August 12, 1996
Reply Comment Date: August 22, 1996

By the Commission:

TABLE OF CONTENTS

I. INTRODUCTION

1. This proceeding involves the development of one of the largest contiguous spectrum segments available to the Commission, "the 28 GHz band."[1] The commercialization of this spectrum enables consumers to receive emerging domestic and global technologies via multiple service providers. Our plan for the band permits a competitive market-driven process to determine which services will succeed.

2. With this *Report and Order*, we designate band segments in the 28 GHz band for several types of wireless systems, clearing the way for licensing Local Multipoint Distribution Service ("LMDS") providers, Fixed Satellite Service ("FSS") systems, and feeder links for certain Mobile Satellite Service ("MSS") systems. The associated downlink bands for satellite services are designated as well.[2] We also adopt a *Fourth Notice of Proposed Rulemaking* proposing to designate an additional band segment, 31.0-31.3 GHz, for LMDS use on a primary protected basis. The Fourth Notice also seeks comment on whether the Commission should adopt eligibility or use restrictions for incumbent local exchange carriers ("LECs")and cable operators for acquisition of LMDS spectrum within their geographic service areas.

3. Our band segmentation plan seeks to promote competition by permitting all proposed services to develop and offer innovative consumer services such as video program distribution, two-way interactive video, teleconferencing, telemedicine, telecommuting, and high speed data services within our borders and around the globe.

4. In a *Third Notice of Proposed Rulemaking*, adopted July 28, 1995,[3] we proposed a

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[1] This refers to the 27.5-30.0 GHz frequency band.

[2] Satellite downlinks paired with satellite uplinks in the 28 GHz band are in the 17.7-20.2 GHz band.

[3] *In the Matter of Rulemaking to Amend Parts 1, 2, 21, and 25 of the Commission's Rules to Redesignate the 27.5-29.5 GHz Frequency Band, to Reallocate the 29.5-30.0 GHz Frequency Band, to Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Services and Suite 12 Group*

band plan to permit all of the proposed services in the 28 GHz band - LMDS, geostationary-orbit FSS ("GSO/FSS") systems, non-geostationary orbit FSS ("NGSO/FSS") systems, and feeder links for non-geostationary orbit MSS ("NGSO/MSS" or "Big LEO") systems. We also proposed rules and policies to govern the LMDS service, issued a Supplemental Tentative Proposal on CellularVision U.S.A.'s ("CellularVision") pioneer's preference application, proposed auction rules for LMDS, and proposed to change the MSS allocation at the 29.5-30.0 GHz band.

5. In response to the *Third NPRM*, we received forty-four comments and nineteen reply comments from entities representing diverse segments of the communications industry.[4] The majority of commenters, representing LMDS proponents and the satellite industry, recognized that our proposed band plan was a reasonable compromise to accommodate all interested parties in the band and generally expressed the desire for more unencumbered spectrum in the 28 GHz band for their proposed service. We will address issues relating to service rules for both GSO/FSS and NGSO/FSS systems proposing to operate in the 28 GHz band in a forthcoming *Report and Order*. Service and auction rules relating to LMDS will also be addressed in a separate *Report and Order*.

II. BACKGROUND

6. The 27.5-29.5 GHz frequency band is allocated for fixed service, fixed-satellite service uplinks and mobile service.[5] In January 1991, the Commission granted the application of CellularVision's predecessor-in-interest, Hye Crest, Inc., for a license to provide LMDS in the 27.5-28.5 GHz frequency band within the New York City Primary Metropolitan Statistical Area (NYPMSA).[6]

7. Meanwhile, NASA's successful launch and operation of its experimental Advanced Communications Technology Satellite (ACTS) initiated demand by satellite entities for the use of the 28 GHz band, and its associated downlink bands. In 1990, Motorola Satellite Communications, Inc. applied for feeder links for its NGSO/MSS system in this band.[7]

Petition for Pioneer's Preference, CC Docket No. 92-297, 11 F.C.C. Rcd. 53 (1995) ("*Third NPRM*").

[4] A complete list of commenters is provided in Appendix A.

[5] *See* 47 C.F.R. § 2.106.

[6] *Hye Crest Management, Inc.* 6 F.C.C Rcd. 332 (1991). The Commission granted the application pursuant to waiver of the point-to-point rules in Part 21 to allow a fixed cellular point-to-multipoint operation for video distribution.

[7] In July 1990, Norris Satellite Communications Inc., filed an application to provide satellite services in the 28 GHz band and obtained an authorization in 1992. However, the Commission has recently declared Norris' authorization null and void for failing to begin timely system construction. *See In The Matter of Norris Satellite Communications, Inc. For Authority to Construct, Launch, and Operate a Ka-Band Satellite*

8. This *Report and Order* is the culmination of a proceeding that was initiated in 1992 by three petitions for rulemaking proposing changes in the rules concerning fixed stations in the 28 GHz band.[8] In the *First NPRM*, released in January 1993, the Commission tentatively concluded that redesignation from fixed point-to-point use to fixed point-to-multipoint could stimulate greater use of the 27.5-29.5 GHz band.[9] The Commission also proposed rules for implementation of LMDS service. Based on CellularVision's existing technology, we also proposed two spectrum blocks of 1000 MHz each for LMDS. In the *First NPRM* the Commission also requested comment regarding the effect of redesignation and the proposed rules on any proposed satellite use of the band.

9. The majority of commenters and reply commenters supported the Commission's finding of widespread interest in both point-to-multipoint and satellite use of the 28 GHz band. The Commission considered various proposals for the 28 GHz band and released the *Second NPRM* in February 1994.[10] We tentatively concluded that it would serve the public interest to allow terrestrial and satellite providers to co-exist in the 28 GHz band. We then established the LMDS/FSS 28 GHz Band Negotiated Rulemaking Committee ("NRMC") to develop technical rules for sharing the band.[11]

10. Despite the significant efforts of the parties involved, the NRMC did not reach consensus on a sharing plan.[12] It concluded that LMDS and FSS service uplinks are not technically able, at this time, to reasonably share the same spectrum. However, CellularVision, Texas Instruments, and Motorola were able to reach general agreement on technical parameters allowing LMDS hub-to-subscriber links and feeder links for NGSO/MSS systems to share the same spectrum, subject to specific agreement on sharing criteria. LMDS proponents and Motorola have not been able to develop any mutually agreed upon sharing criteria for NGSO/MSS feeder links and LMDS subscriber-to-hub links. *See infra* ¶ 37. There was also some preliminary indication that limited sharing could be achieved between

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System DA 96-363 (released March 14, 1996). This decision is subject to Norris' application for review.

[8] *See Third NPRM* at ¶ 10 for a summary of these petitions.

[9] *See In the Matters of Rulemaking to Amend Part 1 and Part 21 of the Commission's Rules to Redesignate the 27.5-29.5 GHz Frequency Band and to Establish Rules and Policies for Local Multipoint Distribution Service*, 8 F.C.C Rcd. 557 (1993) *("First NPRM")*.

[10] *See In the Matters of Rulemaking to Amend Part 1 and Part 21 of the Commission's Rules to Redesignate the 27.5-29.5 GHz Frequency Band and to Establish Rules and Policies for Local Multipoint Distribution Service Second Notice of Proposed Rulemaking*,, 9 F.C.C. Rcd. 1394 (1994) *("Second NPRM")*.

[11] The LMDS/FSS 28 GHz Band NRMC was made up of a representative group of potential service providers and manufacturers from both industries.

[12] The NRMC met between July 26, 1994 and September 23, 1994, concluding when the established two month time period expired. *See Report of the LMDS/FSS 28 GHz Negotiated Rulemaking Committee* (September 23, 1994).

FSS gateway stations (either non-geostationary or geostationary orbit) and LMDS.[13]

11. In the time between the NRMC and the *Third NPRM*, Commission staff conducted several meetings with interested parties to discuss further issues regarding band segmentation and sharing. In the *Third NPRM* we proposed a band segmentation plan that divides the 28 GHz band into discrete spectrum segments with each segment designated to either GSO/FSS, NGSO/FSS, MSS feeder links, or LMDS, on a primary or co-primary basis. We requested that "any commenter asserting that the band plan does not provide sufficient capacity for its system, . . . specify the minimum spectrum required to support its system, supporting this assertion with a concrete technical and economic analysis, and . . . propose a plan that accommodates the reasonable requirements of all qualified applicants."[14]

12. Below we provide a summary of systems proposing service in the 28 GHz band and discuss relevant international allocation decisions influencing our domestic band plan. We then discuss issues concerning the proposed band plan, alternative band plans considered, and present our final band plan.

A. Proposed systems for the 28 GHz band

13. In the *Third NPRM* we described the characteristics of the LMDS, FSS, and MSS systems proposed for the 28 GHz band.[15] Following is a summary of these characteristics, including a description of new satellite applicants and any modifications in the system proponents' applications since the adoption of the *Third NPRM*.

1. LMDS Proposals:

14. LMDS proponents indicate that this new technology will allow LMDS providers to offer services that compete both with LECs in the provision of local exchange service, and with cable operators in the provision of video programming. Very high subscriber capacity for two-way video telecommunications is available through LMDS technology developed for use in the 28 GHz frequency band. Hub transceivers operate in small cells, typically six miles in diameter, which transmit to and receive transmissions from subscriber locations. Because the cells are small, and arranged in a typical cellular pattern, a very high level of frequency reuse is possible. This pattern, combined with the availability of broadband microwave spectrum, results in sufficient capacity in the proposed LMDS system designs offer services that compete both with local exchange carriers in the provision of local exchange service, and with cable operators in the provision of video programming even in urban areas.

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[13] The term "gateways" as used in this context, means earth stations which are limited in number, and are generally larger and easier to coordinate than widely-deployed user terminals.

[14] *Third NPRM* at ¶ 35.

[15] *See Third NPRM* at ¶¶ 17-32.

We expect that LMDS providers will offer facilities-based competition to traditional cable and telephone carriers -- greatly enhancing customer choice, and facilitating the rapid dissemination of innovative communications services with the entry of multiple providers into the market.

15. The wealth of innovative services possible with the LMDS broadband spectrum we make available includes two-way video, teleconferencing, telemedicine, telecommuting, data services and global networks. LMDS systems have the capacity to provide broadband video-on-demand and distance learning. Moreover, LMDS' cellular-like capabilities enable it to offer diverse services within the same region, and to jointly offer services traditionally provided by separate communications service providers.

16. LMDS has attracted attention from both developed and developing countries. Canada has begun licensing this technology (called LMCS) in three gigahertz of spectrum in the frequency band 25.35 to 28.35 GHz. At least six other countries, including Mexico and Venezuela, have licensed LMDS on an experimental or permanent basis in the 28 GHz band.[16] LMDS developers offer the prospect of modern wireless telephone systems, video distribution, and other communications services to developing countries that lack wireline or cable infrastructure.

2. Satellite Proposals:

17. The satellite industry perceives the 28 GHz band as primarily the location for the development of new FSS broadband services provided directly to the home, but also as the expansion band for accommodating growth in existing FSS services. The band is also seen as the location of feeder links for MSS use. The 28 GHz band has the capability to sustain the use of very small earth station antennas and to provide high-speed, broadband interactive services on demand. Three different types of satellite system uses have been proposed in this band: GSO/FSS, NGSO/FSS and feeder links for NGSO/MSS systems. Below we describe new applications, modifications or amendments to existing applications since the adoption of the *Third NPRM.*

a. *Geostationary-Orbit Fixed-Satellite Service Proposals ("GSO/FSS")*

18. Concurrent with the release of the *Third NPRM*, the Commission placed the five Ka-band satellite applications which were on file on public notice and established a September 29, 1995 cut-off date for filing applications to be considered with them.[17] In response, we received thirteen new satellite system applications, amendments, or modifications to

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[16] *Ex parte* notice letter, Michael Gardner, P.C., to William Caton, Acting Secretary, Federal Communications Commission, February 16, 1995; *ex parte* notice letter, Texas Instruments, Inc., to William Caton, June 1, 1995.

[17] Public Notice, Report No. SPB-20, Release No. DA 95-1689, July 28, 1995.

applications for GSO/FSS systems in this band.[18]

19. The GSO/FSS applicants propose a variety of broadband services such as: interactive digital voice, data, and video; electronic messaging; facsimile; video telephony; videoconferencing; satellite news gathering; computer access; direct-to-home ("DTH") video, and telemedicine. Eight applicants propose global coverage and five applicants propose regional coverage.[19]

b. *Non-Geostationary-Orbit Fixed-Satellite Service Proposal ("NGSO/FSS")*

20. Teledesic Corporation is the only NGSO/FSS applicant on file with the Commission.[20] Teledesic proposes a constellation of 840 low-Earth Orbit ("LEO") satellites to provide "broadband capacity in the sky" such as voice, facsimile, two-way digital data, videoconferencing, interactive multi-media and other types of broadband services. Teledesic requests 500 MHz of spectrum in each direction for its standard terminal links, specifically, 28.6-29.1 GHz (uplink) and 18.8-19.3 GHz (downlink). It also requests authority to operate using an additional 800 MHz in the 28 GHz band for gateway-to-satellite feeder links.

c. *Non-Geostationary-Orbit Mobile Satellite Service ("NGSO/MSS") Feeder Links*

21. Feeder links for NGSO/MSS systems use frequencies allocated to the FSS to interconnect a mobile satellite space station with other fixed communications networks by means of one or more central earth stations. The user transceivers are connected to the mobile satellite space station using other mobile satellite frequencies. Motorola, Inc. and TRW Inc. are currently the only two licensed NGSO/MSS systems that have applications for

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[18] *See* applications for AT&T Corp. (File No. 156-162-SAT-P/LA-95); Comm, Inc. (File Nos.163-166-SAT-P/LA-95 and 201-SAT-MISC-95); EchoStar Satellite Corporation (File No. 167/168-SAT-P/LA-95); GE American Communications, Inc. (File No. 169-173-SAT-P/LA-95); Hughes Communications Galaxy, Inc. (File Nos. 3/4-DSS-P/LA-94; CSS-94-021-025 and 174-181-SAT-P/LA-95); KaStar Satellite Communications Corp. (File Nos. 127-SAT-P/LA-95 and 203-SAT-P/LA-95); Lockheed Martin Corporation (File No. 182-186-SAT-P/LA-95); Loral Space & Communications, Ltd. (application originally filed as Loral Aerospace Holdings, Inc.) (File Nos. 109-SAT-P/LA-95; 110-SAT-P-95; 187-SAT-AMEND-95 and 188/189-SAT-P/LA-95); Morning Star Satellite Co. (File No. 190-193-SAT-P/LA-95); NetSat 28 (File No. 194-SAT-P/LA-95); Orion Asia Pacific Corporation (File No. 206-SAT-AMEND-95); Orion Atlantic, L.P. (File No. 204-SAT-ML-95); Orion Network Systems, Inc. (File Nos. 195-197-SAT-P/LA-95; 205-SAT-AMEND-95); PanAmSat Corporation (File Nos. 117-SAT-AMEND-95; 198/199-SAT-P/LA-95 and 202-SAT-AMEND-95); and VisionStar, Inc. (File No. 200-SAT-P/LA-95).

[19] AT&T Corp., GE American Communications, Inc., Hughes Communications Galaxy, Inc., Lockheed Martin Corporation, Loral Space & Communications, Ltd., MorningStar Satellite Co., Orion Asia Pacific Corporation, Orion Atlantic, L.P., Orion Network Systems, Inc., and PanAmSat Corporation propose global systems. The following applicants propose regional service: Comm, Inc., EchoStar Satellite Corporation, KaStar Satellite Communications Corp., NetSat 28, and VisionStar, Inc.

[20] *See* File Nos. 22-DSS-P/LA-94(840); 43-SAT-AMEND-95 and 127-SAT-AMEND-95.

NGSO/MSS feeder links in the 28 GHz band. Specifically, the Commission conditionally authorized Motorola to construct feeder uplinks in the 29.1-29.3 GHz band, and feeder downlinks in the 19.4-19.6 GHz band.[21] Motorola's licensed NGSO/MSS system, Iridium, is under construction and is scheduled for launch this year. TRW was conditionally authorized to construct feeder uplinks in the 29.7-30.0 GHz frequency band, and feeder downlinks in the 19.8-20.1 GHz frequency bands.[22] The 29.7-30.0 GHz band however, was eliminated from consideration as a potential MSS feeder link band as part of the preparations for the World Radio Communications Conference 1995 ("WRC-95").[23] In response to the frequency bands designated for feeder links for NGSO/MSS systems at WRC-95,[24] TRW Inc. submitted a proposed modification to its authorization requesting use of the 29.1-29.4 GHz band for feeder uplinks, and the 19.3-19.6 GHz for its feeder downlinks.[25]

B. Outcome of WRC-95

22. We stated in the *Third NPRM* that the outcome of WRC-95 could affect our ability to implement the proposed band plan.[26] At WRC-95 the U.S. proposals, which were consistent with our proposed 28 GHz domestic band plan, were very successful. Some parties suggested that we request supplemental comments after the conclusion of WRC-95.[27] However, because the results of WRC-95 were consistent with our proposed band plan, as well as the band plan we adopt here, we do not think that it was necessary to do so. In any event, pursuant to our *ex parte* rules, a number of parties have addressed this issue subsequent to WRC-95.

23. Resolution 118 of WRC-95 addresses the bands 18.8-19.3 GHz and 28.6-29.1 GHz. The Conference adopted changes concerning the 18.9-19.3 GHz (downlinks) and 28.7-29.1 GHz (uplinks) bands to facilitate the operation of NGSO/FSS systems on a co-primary basis

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[21] *See Motorola Satellite Communications, Inc.*, 10 F.C.C. Rcd. 2268 (Int'l. Bur. 1995), as corrected by *Erratum*, 10 F.C.C. Rcd. 3925 (Int'l. Bur. 1995); *recon denied* FCC 96-279 (released June 27, 1996).

[22] *See TRW Inc.*, 10 F.C.C. Rcd. 2263 (Int'l Bur. 1995), as corrected by *Erratum* 10 F.C.C. Rcd. 2263 (Int'l Bur. 1995), *recon. denied* FCC 96-279 (released June 27,1996).

[23] *See CPM Report on Technical Operational and Regulatory/Procedural Matters to be Considered by the 1995 World Radio Communication Conference*, (CPM Report), Table 15 (Geneva 1995).

[24] *See* discussion *infra* ¶ 24.

[25] *See* Amendment of Application of TRW Inc. for Modification of License, File No. 155-SAT-ML-95 (filed December 29, 1995).

[26] *See Third NPRM* at ¶ 66.

[27] Comments of GE Americom at 20; Comments of Constellation Communications at 2-3; Reply Comments of Loral/Qualcomm at 2.

with the GSO/FSS.[28] The other 100 MHz of spectrum in each band, 18.8-18.9 and 28.6-28.7 GHz is "frozen" internationally until WRC-97.[29] Resolution 118 also calls for the ITU Radiocommunication Sector (ITU-R) to study conditions for sharing between GSO and NGSO/FSS systems, between NGSO/FSS systems, and between NGSO/FSS and terrestrial systems. These studies are to be taken into account in determining whether the types of changes adopted for the 28.7-29.1/18.9-19.3 GHz bands should also be adopted in the frozen bands, and whether any other adjustments in spectrum allocations are warranted.

24. Resolution 120 of WRC-95 addresses the use of the bands 19.3-19.7 GHz and 29.1-29.5 GHz by NGSO/MSS feeder links. The Conference adopted allocation changes to facilitate use of the 19.3-19.6 GHz (downlink) and 29.1-29.4 GHz (uplink) bands for the operation of NGSO/MSS feeder links on a co-primary basis with the GSO/FSS. Studies will be performed on the other 100 MHz spectrum blocks, 19.6-19.7 GHz and 29.4-29.5 GHz with a view to similar actions in 1997.[30] In addition, WRC-95 adopted the U.S. proposal to permit "reverse band working" in the 19.3-19.6 GHz band for feeder links for NGSO/MSS systems.[31]

III. DISCUSSION

A. NGSO/FSS or GSO/FSS and LMDS - Co-Frequency Sharing Issues

25. In the *Third NPRM*, we tentatively concluded, based on the record at that time, that co-frequency sharing between NGSO/FSS or GSO/FSS systems and LMDS systems was not feasible.[32] Many commenters agree with our tentative conclusion.[33] Some proponents of

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[28] A principle regulatory obstacle to NGSO/FSS service is the International Telecommunication Union's (ITU) Radio Regulation 2613 (RR 2613), which requires any NGSO system to cease operations if it causes unacceptable interference into a GSO/FSS system. The Conference decided that as of 18 November 1995, RR 2613 shall not apply in the bands 18.9-19.3 GHz and 28.7-29.1 GHz.

[29] *See* Resolution 118 Final Acts of the World Radiocommunication Conference, (Geneva 1995). Internationally, "frozen" refers to the fact that the ITU's Radiocommunication Bureau will return any satellite system notifications received, or considered to be received, from any administration after 17 February 1996 and until the last day of WRC-97. Thus, the ITU frequency registration process is "frozen" during this period for systems that have not been notified previously.

[30] *See* Resolution 120 Final Acts of the WRC-95 (Geneva).

[31] As we stated in the *Third NPRM*, reverse band working involves authorizing satellite communications links in a direction opposite to the direction for which the band is allocated. Thus, in the 19.4-19.7 GHz bands, which are allocated for downlinks, uplinks should operate on a "reverse band working" basis. *See Third NPRM* n.61.

[32] *See Third NPRM* at ¶ 43.

LMDS systems in this band disagree, and contend that we should not preclude the possibility of future co-frequency sharing in the band.[34] For example, CellularVision suggests that the Commission adopt a mechanism that would allow it to incorporate co-frequency sharing into the band plan, should any party demonstrate that sharing is feasible.[35] Bell Atlantic asserts that the Commission should permit interested parties to develop the record further on this issue or negotiate co-frequency arrangements.[36] However, these proponents do not supply any additional technical findings on the co-frequency sharing issue and how such co-frequency operations could be implemented.

26. Hughes argues that the Commission should decline to "leave the door open" for co-frequency sharing between LMDS and FSS.[37] Teledesic also asserts that there has been no engineering study submitted in this proceeding demonstrating that such sharing is technically achievable.[38] NASA further asserts that studies by Bellcore and GeoWave have been unsuccessful in finding techniques that would allow co-frequency sharing between LMDS and satellite systems each with ubiquitous consumer terminals operating in the same geographical areas.[39] Comtech Associates asserts that "sharing arrangements as proposed in the Bellcore study will place unnecessary technical and financial burdens on small LMDS operators. Additionally the technical uncertainty surrounding the inability to adequately field test the necessary conditions resulting from multiple service providers in the 28 GHz band will introduce business and financial uncertainty making raising capital for service providers more difficult."[40]

27. We conclude, based on the entire record before us, that co-frequency sharing between either GSO/FSS or NGSO/FSS ubiquitously deployed terminals and LMDS with its

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[33] *See e.g.* Comments of Hughes at 31; Reply Comments of Hughes at 25; Comments of NASA at 7; Comments of ComTech Associates at 2-3; Comments of GHz Equipment Company, Inc. at 3; Comments of Teledesic at 14.

[34] *See e.g.* Comments of CellularVision at 4-5; Comments of Bell Atlantic at 3, and Comments of Endgate Corporation at 4.

[35] *See* Comments of CellularVision at 5.

[36] Comments of Bell Atlantic at 3.

[37] Reply Comments of Hughes at 25-26.

[38] Reply Comments of Teledesic at 4.

[39] Comments of NASA at 8. BellCore and GeoWave each submitted studies after the conclusion of the NRMC, that they contend demonstrate that co-frequency sharing between LMDS and FSS systems is possible. For summaries of the BellCore and GeoWave studies *see Third NPRM* ¶¶ 40-43.

[40] Comments of Comtech Associates at 3.

ubiquitously deployed subscriber terminals, is not feasible at this time.[41] At this time no party has demonstrated the feasibility of sharing, and our conclusion in the *Third NPRM* was clearly supported by the record to date. However, if future technology becomes available to facilitate this type of sharing we would consider revisiting this conclusion.

28. We also deny Qualcomm Incorporated's request to reopen the record in this proceeding, on a limited basis, for supplemental comments on sharing issues among NGSO/FSS systems.[42] Teledesic opposes this request. QualComm's Petition raises issues directly relating to intra-service sharing and licensing policies for NGSO/FSS systems. A forthcoming *Report and Order* will address NGSO/FSS service rules and we do not believe that the adoption of the domestic band segmentation plan precludes the possibility of sharing between NGSO/FSS systems. Therefore, we conclude that reopening the formal comment period in this proceeding is not warranted. Consistent with our *ex parte* rules,[43] several parties have filed comments after the formal comment deadline.

B. Services above 40 GHz

29. In the *Third NPRM*, we also tentatively concluded that the 40.5-42.5 GHz ("40 GHz band") is not currently suitable for either the LMDS or fixed satellite services, as proposed in this docket.[44] Many LMDS proponents agree with our tentative conclusion.[45] CellularVision, for example, contends it and other parties demonstrated in comments in ET Docket 94-124[46] that based on "significant differences in signal propagation characteristics, component technology and system implementation, the cost of providing LMDS service at 40 GHz would be significantly more expensive than the cost at 28 GHz, thus rendering 40 GHz LMDS

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[41] Andrew Corporation claims its prototype conical antenna facilitates co-frequency sharing. *See* Comments of Andrew Corporation at 3. Pacific Telesis asserts that system proponents consider the antenna in system designs, but the Commission should not consider an additional period of negotiations and evaluations. Reply Comments of PacificTelesis at 2. Hughes argues that this antenna is "unproven" and the technical data submitted with Andrew's Comments provides no support for its conclusion that LMDS and GSO/FSS can share the spectrum. Reply Comments of Hughes at 25. The record demonstrates that co-frequency sharing between LMDS and FSS is a multifaceted problem. We believe that the antenna silo performance Andrew claims to fix is only one aspect of the sharing problem and alone does not permit us to determine that co-frequency sharing is feasible.

[42] *See Petition for Supplemental Comments of QualComm, Incorporated* CC Docket No. 92-297, (filed Feb. 28, 1996).

[43] *See generally,* 47 C.F.R. § 1.1206.

[44] *See Third NPRM* at ¶¶ 36-38.

[45] Comments of CellularVision at 5.

[46] *In the Matter of Parts 2, 15, and 97 of the Commission's Rules to Permit Use of Radio Frequencies Above 40 GHz for New Radio Applications, (NPRM)*, 9 F.C.C. Rcd. 7078 (ET Docket No. 94-124).

commercially unviable."[47] However, GHz Equipment Company, a manufacturer of equipment for MMDS video distribution, asserts that it can produce inexpensive analog equipment at 40 GHz and further asserts that digital delivery systems are being tested by GHz Equipment and can be accommodated in this spectrum. It indicates, however, that digital equipment will cost significantly more with today's pricing regardless of the spectrum band employed.[48] Moreover, some LMDS proponents envision that specialized terrestrial services may become suitable for the 40 GHz band in the future, as technology advances and 40 GHz equipment is developed and becomes commercially available.[49]

30. NASA asserts that the principal accommodation of LMDS should be in the 40 GHz band.[50] NASA argues that the Commission erred in its conclusion based on representations of 28 GHz LMDS proponents which claim LMDS is not viable at 40 GHz,[51] and that many telecommunications and technology development companies in the country assert that technology is readily available to develop LMDS in the 40 GHz frequency band.[52] TRW contends that the Commission failed to provide a rational basis for its tentative conclusion that locating LMDS at 40 GHz is not feasible.[53] Lockheed Martin and GE Americom assert that the record has not demonstrated that the cost increase of providing LMDS in the 40 GHz band would make LMDS service prohibitive.[54] TRW and GE Americom also suggest that the 40 GHz band provides an alternative for LMDS if the 28 GHz band sharing issues cannot be worked out.[55]

31. The record indicates that equipment for provision of LMDS is already available in the near term for the 28 GHz bands, while substantial additional development and costs would be required for implementation of this service in the 40 GHz band. In light of our recognition of

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[47] Reply Comments of CellularVision at 15.

[48] Comments of GHz Equipment Company at 3.

[49] Comments of CellularVision at 5-6; Comments of Comtech at 2; Comments of Pacific Telesis at 2.

[50] Comments of NASA at 1.

[51] NASA comments at 9.

[52] *Id.* at 12. NASA contends that the 40 GHz spectrum is not suitable for FSS. It asserts that LMDS systems, by their terrestrial nature can compensate for differences in rain attenuation across different rain zones by varying their cell sizes and thereby varying the path length through the rain. Satellites on the other hand, must traverse the same path length through the atmosphere at a given elevation angle for all rain zones. *Id.* at 14.

[53] Comments of TRW at 35.

[54] Comments of Lockheed Martin at 3; Comments of GE Americom at 19.

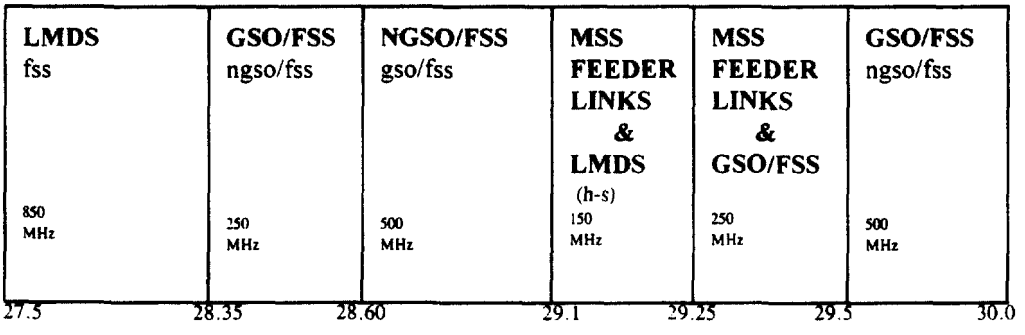
[55] Comments of TRW at 37; Comments of GE Americom at 18.

LMDS as a potential source of competition in the local telephony and multi-channel video programming distribution ("MVPD") markets, we believe it is important to immediately authorize deployment of LMDS. While the 40 GHz band may prove useable in the longer term for some or all of the types of services proposed by LMDS, or satellite services, we make no decisions here regarding use of the 40 GHz band. Rather, we will address such uses in the pending above 40 GHz proceeding.[56]

C. Band plan proposed in the Third NPRM and Alternative Band Plans Considered

1. Third NPRM

32. The band plan proposed in the *Third NPRM* was the result of months of discussions with interested parties and filings in the proceeding. Specifically, we proposed to segment the 28 GHz band by designating 1000 MHz each for LMDS and GSO/FSS systems; 500 MHz for NGSO/FSS systems; and 400 MHz for MSS feeder links. We proposed sharing in 150 MHz between NGSO/MSS feeder links and LMDS at 29.1-29.25 GHz, with a prohibition on subscriber-to-hub transmissions for LMDS systems. We also proposed sharing in 250 MHz between GSO/FSS systems and NGSO/MSS feeder links at 29.25-29.5 GHz. We proposed coordination between these systems on a "first-come-first served" basis.[57] We also indicated in the *Third NPRM* that we may authorize the feeder links of at least one NGSO/MSS system, TRW, on a reverse band working basis in the 19.4-19.7 GHz band.[58] The band plan as proposed in the *Third NPRM* is represented as follows:



33. The majority of commenters supported our proposed band plan as a reasonable compromise to accommodate all proposed services in the band. However, commenters did

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[56] *Supra* note 46.

[57] *See Third NPRM* at ¶ 64.

[58] *See supra* note 31 for definition of reverse band working.

submit alternative band plans and other suggested modifications to our proposal.[59] Many parties, as requested in the *Third NPRM*, also submitted analyses on specific technical sharing issues raised by the band plan.[60] Commission staff met repeatedly with representatives of both satellite and LMDS proponents to discuss concerns regarding specific sharing proposals, particularly within the 29.1-29.5 GHz band segment.[61]

34. We proposed to designate the 29.1-29.25 GHz band segment for assignment to NGSO/MSS feeder links and LMDS systems on a co-primary basis. For this 150 MHz we based our proposed sharing criteria on an agreement reached by Motorola, CellularVision and Texas Instruments with respect to frequency sharing during the NRMC.[62] This agreement provided that subscriber transceivers would not be permitted to transmit in this shared band. We also proposed specific sharing rules for hub-to-subscriber transmissions in this 150 MHz.[63] Nevertheless, we did suggest in the *Third NPRM* that it may be possible to permit LMDS subscriber-to-hub transmissions in the 150 MHz of the shared spectrum under certain sharing criteria.[64] We specifically requested comment on whether, and, if so, the extent to which, sharing methods may be used to permit two-way LMDS operations in the 150 MHz shared with MSS feeder links.[65]

35. We received extensive comments on sharing in the 29.1-29.25 GHz segment. Motorola asserts that the restriction on LMDS subscriber-to-hub traffic is necessary for the unimpeded operation of the Iridium system feeder links.[66] Several LMDS proponents argue that the Commission should not adopt any restrictions on subscriber equipment transmitting in the 150 MHz shared band and view the proposed rules as unreasonably encumbering LMDS operations.[67] Specifically, the prohibition of subscriber-to-hub transmissions may effectively

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[59] *See e.g.* Comments of Hughes Communications Galaxy; Comments of NASA; Comments of Telecommunications Industry Association; and Comments of GE Americom.

[60] *See e.g.* Joint Comments of Motorola Satellite Communications, Inc. and Iridium, Inc., Comments of Hughes Communications Galaxy, Inc., Comments of Texas Instruments, and Comments of TRW Inc.

[61] All such *ex parte* discussions are documented in CC Docket 92-297.

[62] *See* Report of the LMDS/FSS 28 GHz Band Negotiated Rulemaking Committee, Addenda.

[63] *See Third NPRM* at Appendix B.

[64] *See Third NPRM* at ¶ 63.

[65] *Id.*

[66] Joint Comments of Motorola Inc. and Iridium, Inc. at 3.

[67] *See* Comments of BellSouth Corp., BellSouth Telecommunications, Inc. & BellSouth Enterprises, Inc. at 5; Comtech Associates, Inc. at 2; Comments of Endgate Corporation at 2; Comments of Hewlett-Packard Company at 4; Comments of Northern Telecom Inc. at 5; Comments of Nynex Corporation at 4; Comments

eliminate the ability of interactive LMDS communications in this portion of the 1000 MHz designated for LMDS. Moreover, Texas Instruments asserts that using part of the 27.5-28.35 GHz band for return links would require a 120 MHz guardband between hub-to-subscriber and subscriber-to-hub links at the same cell site to be implemented in this 850 MHz, leaving only 730 MHz of useful spectrum for LMDS forward and return links.[68] Texas Instruments also asserts that in addition to the guardband a diplexer[69] (costing between $70-$100) would be required in each subscriber's equipment to implement the return link.[70]

36. Texas Instruments, Hewlett Packard and Endgate Corporation also submitted analyses which they assert demonstrate that LMDS subscriber stations in the 29.1-29.25 GHz band would not cause unacceptable interference to Iridium MSS feeder uplink receivers.[71] Motorola filed reply comments contending that the analyses were based on "a series of faulty technical and behavioral assumptions."[72]

37. The Commission facilitated discussions among interested parties trying to reach a sharing arrangement that would permit subscriber-to-hub transmissions in the 150 MHz band segment. After months of extensive discussions, the parties failed to agree on a mutually acceptable sharing arrangement.[73] We agree with the parties that, at this time, undesirable constraints would need to be placed on either Motorola's NGSO/MSS system feeder links or LMDS subscriber-to-hub links in order to permit sharing in this 150 MHz band segment.[74] Should the parties in the future agree that LMDS return links can operate here in this band under mutually acceptable sharing criteria with NGSO/MSS licensees and applicants, we would reconsider the LMDS uses in this band segment.

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of Pacific Telesis Wireless Broadband Services at 2; Comments of Texas Instruments at 7, and Comments of Titan Information Systems Corporation at 3; Joint Comments of the Association of America's Public Television Stations (APTS) and Public Broadcasting Service (PBS); Comments of M3 Illinois Telecommunications Corporation at 2.

[68] Comments of Texas Instruments at 7.

[69] A diplexer is a device that allows equipment to transmit and receive in the same frequencies.

[70] Comments of Texas Instruments at 7.

[71] *See* Comments of Texas Instruments at Appendix A; Comments of Hewlett Packard at Appendix B and Comment's of Endgate at 2-4.

[72] Joint Reply Comments of Motorola Satellite Communications, Inc. and Iridium, Inc. at 5.

[73] However, TRW, because of different system parameters than Motorola, was able to develop sharing principles with LMDS in the subscriber-to-hub direction. *See* Letter from Stephen D. Baruch (Counsel, TRW) to William F. Caton (June 3, 1996).

[74] We also reject Nynex Corporation's suggestion that we refer the record, the NRMC information and post-NRMC *ex parte* proposals, to an independent Technical Advisory Committee for further development. Comments of Nynex at 7-8.

2. Commission Band Segmentation Options Considered

38. The Commission considered various band segmentation plans over the last several months with the goal of accommodating the various divergent proposals made in response to the band plan proposed in the *Third NPRM*.[75] For example, we considered plans which ultimately proved to require difficult inter-service sharing rules and to not completely support interactivity of LMDS systems.[76] We also considered a band plan that designated 1000 MHz each for GSO/FSS and LMDS service. That plan, however, would have divided LMDS among three non-contiguous spectrum segments.[77] This option was not acceptable to the potential LMDS service providers because, they argued, it would have significantly decreased spectrum efficiency for LMDS, resulting in increased cost and delay in offering both subscriber and hub equipment.[78] We also considered two band plans that designated GSO/FSS systems with less than 1000 MHz.[79] These options were unacceptable to the GSO/FSS applicants because, they argued, any of these plans would result in a significant loss of system capacity and revenue.[80] Another plan, resulting from a GSO/FSS applicant's proposal, was also considered. It would have designated a total of 1010 MHz to GSO/FSS applicants and 985 MHz to LMDS, but required sharing of 135 MHz between GSO/FSS and LMDS.[81] However, the mutually acceptable sharing principles required to implement this

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[75] *See ex parte* submission filed by the International Bureau to William F. Caton, (Feb. 6, 1996) for diagrams of Commission Band Plan Options 1, 2, 2A, 2B, 3(a), 4 and 5. *See ex parte* submission filed by the International Bureau (March 5, 1996) for diagram of Option 4 prime.

[76] *See* Options 2, 2(a), and 2(b).

[77] *See* Option 5.

[78] *See* letter from representatives of Endgate Technologies, Hewlett-Packard, and Texas Instruments to William F. Caton (March 6, 1996). *See also* letter from Michael R. Gardner (Counsel, CellularVision) to Scott Blake Harris (Chief, International Bureau) and Michele Farquhar (Chief, Wireless Telecommunications Bureau) (March 6, 1996).

[79] *See* Options 3(a) and 4.

[80] *See ex parte* letter from representatives of Hughes, AT&T, Lockheed Martin, GE and Loral to Scott Blake Harris and Michele Farquhar (February 28, 1996). Option 4 also reduces the amount of usable spectrum available to Motorola by 50% and severely impacts its system's communications link of "last resort" for the control of the satellite. *See* Letter from Michael D. Kennedy (Vice President and Director, Regulatory Relations, Motorola) to William F. Caton (February 22, 1996).

[81] *See* Option 4 prime. *See also* Letter from Thomas K. Gump (Counsel, Lockheed Martin) to William F. Caton (February 23, 1996) "Option 4A." However, Option 4A involved the sharing of only 75 MHz of spectrum with LMDS.

plan were not developed by the LMDS and GSO/FSS parties.[82] We were also unable to successfully propose sharing criteria.

39. In March 1996, NASA was also asked to undertake an immediate study to assess whether its space services and LMDS could share spectrum below 27.5 GHz.[83] NASA concluded three weeks later that no rules acceptable to all parties could be drafted which would guarantee protection of NASA space services from harmful interference.[84] NASA also concluded that coordination with other space service systems in the band from other administrations would make this a difficult option to implement effectively. Texas Instruments requests that we decide, as part of this *Report and Order* "to reopen discussions with NTIA to reexamine the federal spectrum requirements and the possibilities for federal/non-federal sharing in or reallocation of the 25.25-27.0 GHz and 27.0-27.5 GHz bands and to pursue those discussions at the earliest possible time."[85] Notwithstanding NASA's initial conclusions on sharing, and the band plan we adopt today, we agree that more in-depth sharing studies of fixed services and LMDS and Government spectrum below 27.5 GHz may yield more positive results. Accordingly, we direct the staff to continue discussions with NTIA through the Interdepartment Radio Advisory Committee (IRAC) process to explore the feasibility of shared use or reallocation of some portion of this band from the Government for commercial usage.

40. We conclude that many of the alternative band plans described above fail to provide adequately for the operational needs of one or more of the proposed systems. We find, based on the record and for the reasons discussed below, that the band plan proposed in the *Third NPRM,* along with the additional inter-service sharing rules, is the most reasonable compromise to allow all proposed systems in the 28 GHz band to be authorized. In addition, we adopt a *Fourth Notice of Proposed Rulemaking* proposing that the 31.0-31.3 GHz band be designated for LMDS use. We propose that potential LMDS service providers be able to use this additional spectrum to meet the interactive needs of some of the proposed LMDS technologies. We are aware that some LMDS proponents oppose, for a variety of reasons,

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[82] *See* Letter from Charles M. Kupperman (Vice President, Washington Operations, Space and Missiles Sector, Lockheed Martin) to William F. Caton (June 3, 1996). Hughes also argues that the primary consequences of adopting Options 4 or 4 Prime would be (i) delay in provision of broadband satellite service in the U.S. (ii) significantly decreased service capabilities, and (iii) increased cost to consumers. *See* Letter from Edward J. Fitzpatrick, (Vice President of Hughes Communications) to Chairman Hundt and the Commissioners (March 15, 1996).

[83] Frequencies in this range are currently allocated for government use.

[84] *See* Letter from Charles T. Force (Associate Administer for Space Communications, NASA) to Mr. Lionel S. Johns (Associate Director of Technology, Office of Science and Technology Policy), and enclosure *Feasibility of Sharing between NASA Space Systems and LMDS systems near 27 GHz* (April 17, 1996).

[85] *See, e.g.*, Letter from Robert L. Pettit (Counsel, Texas Instruments) to Chairman Hundt and Commissioners (July 9, 1996).

any plan proposing to designate LMDS in the 31 GHz band.[86] However, we believe adopting this band plan along with the *Fourth Notice of Proposed Rulemaking, infra* Part IV, is in the public interest and will hasten the availability of all proposed services to consumers.[87]

D. Commission Band Segmentation Decision for the 27.5-30.0 GHz Band

41. We adopt this band segmentation plan with the following objectives in mind:

- Ensuring consistency with international and domestic allocation decisions, as set forth in the ITU and FCC Tables of Allocations;
- Providing for coordination of new systems with existing services in the band;
- Designating discrete band segments for services which do not appear capable of sharing at this time; and
- Providing maximum flexibility for system implementation, inter-system sharing, and future system growth.

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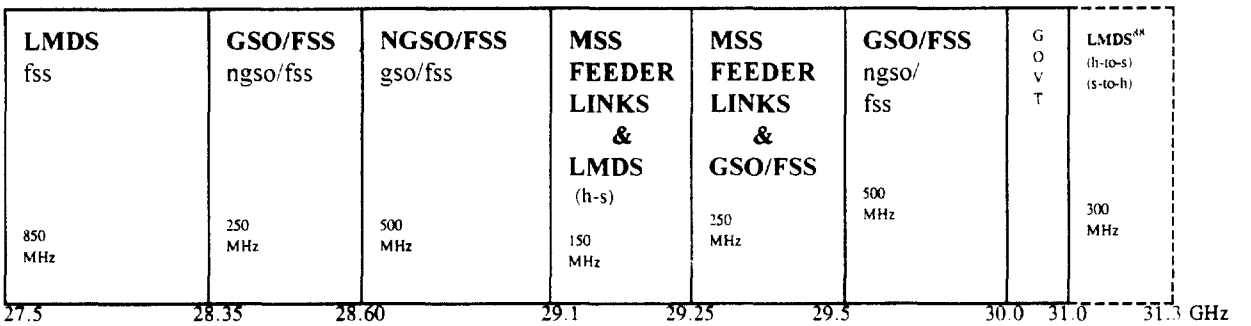
[86] *See* Letter from Paul E. Misener (Counsel, Texas Instruments) to William F. Caton (April 26, 1996); Letter from Mickey R. Gardner (Counsel, CellularVision) to Robert James (Wireless, Telecommunications Bureau, FCC) (March 29, 1996); Letter from Douglas A Gray (Program Manager, Hewlett Packard) to Bob James (March 29, 1996); Letter from Douglas A Gray to Jennifer Warren (Wireless Telecommunications Bureau, FCC) (June 18, 1996); Letter from Robert L. Pettit (Texas Instruments) to Chairman Hundt and Commissioners, (June 19, 1996). *But see* Letter from Douglas Gray to Jennifer Warren (May 17, 1996).

[87] Many parties to the proceeding support adoption of *Third NPRM* band plan. *See* letter to Chairman Hundt and Commissioners, signed by representatives of CellularVision USA, Inc; AT&T; Hughes Communications Galaxy, Inc.; Teledesic Corporation; Motorola, Inc.; The University of Texas - Pan American; Philips Electronics North America Corporation; Titan Information Systems; CellularVision of New York, L.P.; M/A COM, Inc.; RioVision of Texas, Inc.; International CellularVision Association; CellularVision Technology & Telecommunications, L.P.; Ge American Communications, Inc., (June 3, 1996). *See also* letters, supporting adoption of *Third NPRM* band plan and the 31 GHz option, from: R. Gerard Salemme (Vice President, AT&T) to Chairman Hundt (May 31, 1996); John P. Janka (Counsel, Hughes) to William F. Caton (May 30, 1996) and Charles M. Kupperman (Vice President, Lockheed Martin) to William F. Caton (June 3, 1996).

42. The Commission's band segmentation plan is depicted graphically as follows:

Uplink Band 27.5 - 30.0 GHz



43. The plan we adopt designates co-frequency sharing in band segments where the Commission and the parties have concluded it is technically feasible. We conclude that adoption of this band plan promotes spectrum efficiency and facilitates the deployment of diverse, interactive, competitive services for consumers.[89]

44. The band segmentation plan will be implemented through appropriate changes in Part 25 and Part 101 of our rules. We are designating discrete spectrum bands for specific types of systems. Services designated for domestic licensing priority are specified in capital letters in the graphic depiction of the band plan. These services have licensing priority vis-a-vis any other type of service allocated domestically or internationally in the band. Lower-case letters indicate services in a particular band segment which also have licensing priority vis-a-vis any third service allocated domestically or internationally in the band, but have no licensing priority over the service in capital letters in the band segment and must operate on a non-interference basis and must accept interference vis-a-vis that service.[90] Services designated with two priority users have equal licensing rights based on the sharing principles adopted for that particular band segment. See discussion *infra* ¶¶ 63-74 on sharing.

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[88] *See infra* Part IV *Fourth Notice of Proposed Rulemaking* on 31 GHz band.

[89] Although some parties have pointed out to the Commission the potential of raising substantial revenues from auctions in discussions of the various band plans, the Commission, pursuant to 47 U.S.C. § 309(j)(7)(A), may not consider auction revenues in making spectrum allocation determinations and has not done so in this proceeding.

[90] Teledesic recommends that the Commission adopt a local priority designation for LMDS in the band segment proposed for LMDS rather than amend the domestic table of frequency allocations to establish a primary or co-primary designation for LMDS. Comments of Teledesic at 6. However, since we are not amending the domestic table of frequency allocations, it is necessary to adopt domestic priority designations not just for LMDS, but for NGSO/FSS, GSO/FSS and MSS feeder links.

1. Primary LMDS Spectrum

45. We designate 1000 MHz of spectrum for LMDS systems in two non-contiguous segments. At 27.5 - 28.35 GHz we designate 850 MHz for LMDS on a primary basis. GSO/FSS or NGSO/FSS systems will be permitted on a non-interference basis to the LMDS systems in the 850 MHz band segment, for the purpose of providing limited gateway-type services. We designate another 150 MHz of spectrum at 29.1-29.25 GHz for LMDS transmissions, in the hub-to-subscriber direction, on a co-primary basis with NGSO/MSS feeder links.[91] We also propose to designate 300 MHz at 31.0-31.3 GHz for additional LMDS use. *See Fourth Notice of Proposed Rulemaking infra* Part IV.

46. Many LMDS proponents assert that 1000 MHz, with no restriction on subscriber-to-hub or hub-to-subscriber transmissions, is the minimum amount of spectrum necessary to provide a competitive interactive LMDS service.[92] We conclude that some planned LMDS services and equipment can be supported within this 1000 MHz of spectrum.[93] Furthermore, this band plan combined with the proposed use of the 31 GHz band will ensure that a greater array of proposed LMDS systems can be accommodated. In the *Third NPRM*, we also tentatively concluded that we could not designate more than 850 MHz of contiguous spectrum to LMDS at the lower end of the band, and noted that designating the additional 150 MHz requested by LMDS proponents at 29.1-29.25 GHz would be a reasonable compromise.[94]

47. GE Americom suggests that the Commission offer some protection to FSS gateways operating in the 27.5-28.35 GHz band segment. Specifically GE Americom requests "that if an FSS provider selects and coordinates a gateway site with existing LMDS operations, it will not be required to terminate its gateway operations if an LMDS licensee subsequently adds a station within the gateway's potential interference zone."[95] Some LMDS

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[91] *See* discussion on sharing *infra* at ¶¶ 67-71.

[92] Comments of Bell Atlantic at 2; Comments of BellSouth at 6; Comments of CellularVision at 3; Comments of ComTech Associates, Inc. at 2; Comments of GHz Equipment Company, Inc at 2; Comments of Texas Instruments at 11. *But see,* Comments of GTE at 2-3 "LMDS can (and will be) viable and competitive with considerably less than 1 GHz of spectrum. GTE believes other factors are just as important as the amount of spectrum and must be taken into consideration in designing a proper structure for LMDS."

[93] NASA, however, asserts that the introduction of LMDS into the 27.5-29.5 GHz band is inconsistent with global use of FSS allocations. Comments of NASA at 3. In the absence of a global decision on the fixed service allocation in the 27.5-29.5 GHz band, we see no inconsistency warranting prohibition of LMDS service in these bands.

[94] *Third NPRM* at ¶ 50.

[95] Comments of GE Americom at 18.

proponents voiced concern over secondary FSS gateway operations at 27.5-28.35.[96] For example, Endgate Corporation believes it would be appropriate for the Commission to require the FSS system operator to notify the existing LMDS operator of its intention to install a "gateway" station and to coordinate with the LMDS operator to prove non-interference before the installation.[97] CellularVision believes the Commission should make clear that in order to operate a gateway station on a secondary basis, an FSS proponent first would have to demonstrate that it would not cause interference to the operations of the primary user in that band, the LMDS licensee, and if such FSS operations ever did cause interference to the primary user, LMDS, the FSS operator would have the burden to resolve the interference or cease operations.[98]

48. We reject GE Americom's proposal that the Commission offer some protection to FSS gateways operating in the 27.5-28.35 GHz band segment. GE Americom's proposal is inconsistent with the designation of FSS for secondary licensing priority in the 27.5-28.35 GHz band and potentially deprives LMDS of its domestic priority designation. If proponents of FSS systems implement gateways in this part of the band, it will be on a non-interference basis to LMDS, and accordingly these systems will not be able to claim protection against harmful interference from LMDS operators.

49. We also reject GE Americom's proposal that NGSO/MSS feeder links be given a co-primary allocation within the 27.5-28.35 GHz band designated for LMDS, pursuant to the sharing arrangement that has been worked out between those parties in the Negotiated Rulemaking.[99] Such a co-primary allocation would be inconsistent with international allocations, in that no specific provision has been made in the international frequency allocation tables for operation of NGSO/MSS feeder links in the 27.5-28.35 GHz band. Furthermore, even assuming the associated international coordination issues of such a proposal could be adequately addressed, co-primary operations would impose operational constraints on both LMDS systems and NGSO/MSS feeder links.

50. Teledesic recommends that all authorized users of the 28 GHz band be required to utilize digital technology.[100] CellularVision filed reply comments contending that it and

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[96] Comments of Endgate Corporation at 1; Reply Comments of CellularVision at 11; Reply Comments of Comtech at 6.

[97] Comments of Endgate Corporation at 1.

[98] Reply Comments of CellularVision at 11.

[99] Comments of GE Americom at 3.

[100] *See* Comments of Teledesic at n.2 citations omitted. GHz Equipment Company also contends that spectral efficiency beyond analog delivery should be required by the Commission. Comments of GHz Equipment Company at 3. *See also* Reply Comments of ComTech Associates at 2 "both proponents of digital and analog LMDS systems remain clear in their need for 1,000 MHz."

other LMDS proponents may implement digital compression if and when it becomes available commercially.[101] CellularVision also asserts that it has been established in this proceeding that digital technology is not commercially feasible today for LMDS operations.[102] This issue will be addressed fully in the satellite and LMDS service rules, respectively.

a. *Grandfathering CellularVision's NYPMSA License*

51. In the *Third NPRM*, we proposed to include, as a condition of CellularVision's PMSA license renewal,[103] a provision permitting CellularVision to operate on the contiguous 1 GHz for which it is presently licensed for a period of 36 months following the release date of this Order, or until the first GSO satellite operating in this spectrum is launched, whichever occurs later.[104] We further proposed to condition the license upon a provision specifying that at the end of the grandfather period, CellularVision's license would become subject to our generally applicable rules for the provision of LMDS service. Thus, at that time, CellularVision would be required to cease operation in the 150 MHz designated for GSO/FSS operations in the 28.35-28.50 GHz band. Simultaneously, it would be permitted to operate in the 150 MHz at 29.1-29.25 GHz.

52. CellularVision, Bell Atlantic, and Titan filed comments in support of our grandfather proposal. With regard to the termination period for the grandfathering provision, CellularVision requests clarification that the Commission's definition of "launched" contemplates the point at which a satellite is actually put into service.[105] It notes that there is typically a period of several months between the launch of a satellite and its inauguration of service. CellularVision argues that to require it to migrate from the spectrum prior to that point would be unnecessary.[106]

53. Some GSO/FSS entities expressed concern that this proposal would allow CellularVision to interfere with deployment of their operations. Hughes asserts that the grandfathering provision as proposed could provide an incentive for CellularVision to stall the licensing of GSO/FSS systems in order to provide a longer transition period for itself.[107]

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[101] Reply Comments of CellularVision at 22.

[102] *Id.*

[103] We anticipate processing the CellularVision renewal application at, or shortly after, the time generally-applicable LMDS service rules are adopted.

[104] *Third NPRM* at ¶ 72.

[105] Comments of CellularVision at 10.

[106] *Id.* at 11.

[107] Comments of Hughes at 30.

Hughes argues that it is critical that the Commission establish a definitive deadline for this transition that is not subject to change or exception. Hughes states that its investors and lenders "require comfort" that the satellite launch will not be hindered by further regulatory delays. Hughes argues that the Commission should adopt a three-year transition period for CellularVision and make clear that it will not consider any exceptions or extensions.[108] GE Americom agrees with Hughes and believes the Commission must adhere to its deadline for CellularVision to vacate this spectrum so that CellularVision's operation in the New York service area will not be permitted to interfere with the development of GSO/FSS services.[109] Orion claims it is conceivable that CellularVision would attempt to leverage its position as a service provider to existing subscribers to persuade the Commission to remove the time limit on its temporary use of the 150 MHz from 28.35-28.50.[110]

54. It is our intention to facilitate the development of LMDS in New York and the rest of the nation, as well as the deployment of GSO/FSS systems. We recognize that permitting CellularVision to proceed with its business plan and existing system design in the contiguous 1 GHz for which it was originally licensed will help ensure a seamless transition for CellularVision's customers as LMDS is licensed pursuant to the band plan implemented in this *Report and Order*. We also recognize the concerns of potential GSO/FSS licensees that CellularVision's operations in the band may interrupt implementation of GSO/FSS systems designated for the band. Accordingly, in order to ensure certainty for both CellularVision's customers and for potential GSO/FSS systems planning to provide service in the United States in the 28.35-28.50 GHz band, we clarify our reference to "launch" as the date which the first GSO/FSS satellite, intended to operate in the 28.35-28.50 GHz band, leaves the Earth's surface. The satellite licensee is responsible for notifying CellularVision six months prior to the planned launch date, and for giving CellularVision, upon its request, updates on the satellite's status. CellularVision has the responsibility to remain apprised of the satellite's status and to ensure that LMDS operations cease on the 150 MHz allocated for GSO/FSS operations in accordance with the order herein. With these safeguards provided by this clarification, we do not believe that the concerns expressed by some of the GSO/FSS applicants regarding interference from LMDS operations will be realized.

55. We also find it necessary to adjust the amount of time for which CellularVision will be grandfathered from our proposal in the *Third NPRM*. Instead of 36 months, we find that 24 months from the release date of this *Report and Order*, or by the date of launch of the first GSO/FSS satellite, whichever occurs later, is appropriate. Our reasons for this finding are that the time proposed in the *Third NPRM* was intended to coincide approximately with the expected launch date of the first GSO/FSS satellite proposed for this band. At that time, launch was expected in approximately three years. Due to delays in adjusting the band

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[108] *Id.*

[109] Reply comments of GE Americom at 17-18.

[110] Reply Comments of Orion Network Systems at 10-11.

segmentation plan for the 28 GHz band, a full year has passed since adoption of the *Third NPRM*. Since we intend to facilitate both LMDS and the GSO/FSS applicants for the 28 GHz band, we find that it is reasonable to grandfather CellularVision for the same benchmark, i.e., the expected launch of the first GSO/FSS satellite. Since that projected launch date has not changed, we believe it is fair to set the sunset period for 24 months from the release date of this *Report and Order*. Moreover, we do not believe that this decision results in unfairness to CellularVision because its expansion applications have been granted, and CellularVision has had the authority to build out its system throughout the NYPMSA on its original authorization of 1 GHz at 27.5-28.5. The same expansion which would have been possible under the grandfather provision has been available to CellularVision for this length of time. Therefore, we require CellularVision to vacate the 28.35-28.50 GHz band by 24 months following the release date of this *Report and Order*, or by the date of launch of the first GSO/FSS satellite intended to provide service in the United States in this band, whichever occurs later.

b. Effect of Band Segmentation on CellularVision's NYPMSA License

56. The effect of this band plan is to require CellularVision to transition to the non-contiguous spectrum designated in this *Report and Order*, which may necessitate retuning or replacing existing equipment. As a result, we believe it is appropriate to facilitate CellularVision's transition to the band plan we adopt today by authorizing its concurrent use of its authorized 1 GHz at 27.5-28.5 GHz and the newly designated 150 MHz at 29.1-29.25 for hub-to-subscriber transmissions during the grandfathered period.

2. Primary GSO/FSS Spectrum

57. We designate 750 MHz of exclusive primary spectrum for GSO/FSS systems, in two non-contiguous segments at 28.35-28.60 GHz and 29.5-30.0 GHz. NGSO/FSS systems will have secondary status in these segments. We also designate GSO/FSS use for 250 MHz on a co-primary basis with NGSO/MSS feeder links at 29.25-29.5 GHz.[111]

58. In the *Third NPRM* we stated that broadband satellite applications require more bandwidth than current data operations, and that 1000 MHz of spectrum is needed to support multiple 28-GHz band GSO/FSS systems. NASA and Loral Space Communications, Ltd. (Loral) contend that GSO/FSS systems require more than 1000 MHz of 28 GHz band spectrum.[112] Several GSO/FSS proponents have indicated that 1000 MHz of 28 GHz spectrum, free from technical constraints, is the minimum amount of spectrum needed to

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[111] *See* discussion on sharing issues *infra* ¶¶ 72-74.

[112] PanAmSat Corporation suggests that the entire Ka-band should be allocated to satellite services. Comments of PanAmSat at 2. CellularVision argues that PanAmSat provides no basis for exclusion of LMDS from the band and that Loral's plan to give FSS 1.25 GHz of contiguous spectrum does not provide justification. Reply Comments of CellularVision at 8-9.